The OUNCE and the POUND

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The OUNCE and the POUND

FOR GYPSUM PLASTER

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"An OUNCE of Prevention is worth a POUND of Cure"

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CELOTEX

ANCHOR

PLASTER

THE CELOTEX CORPORATION
919 North Michigan Ave., Chicago, Illinois

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THE OUNCE AND THE POUND

FOR GYPSUM PLASTER

"An Ounce of Prevention is Worth a Pound of Cure"

FORTY YEARS AGO, there were no gypsum plaster job problems. Lime plaster walls which hardened slowly, were the order of that day, in spite of the fact that gypsum is one of the oldest building materials known to man. It was used in the building of the pyramids 4,000 years ago, but it remained for this generation to develop its use for wall plaster.

Since the day it was discovered that gypsum mortar would harden on walls faster than the older wall finishing materials, extensive practical use and intensive research by industrial engineers have proved gypsum's superiority.

Properly manufactured gypsum plaster, carefully mixed and applied over the right plaster bases, will produce strong, hard walls. But, as in every instance when the human element enters, there are many chances along the line between the mining of gypsum rock and the finishing of the plastered wall where mistakes can be made which will lead to unsatisfactory results. With advance knowledge of them, most of these mistakes can be avoided, and trouble prevented before it develops.

To provide the ounce of prevention, this little handbook has been prepared.

It describes the difficulties which may be encountered in mixing and applying gypsum plaster, tells how they may be avoided, and how they may be remedied.

The process of mixing and applying gypsum plaster is so closely related to the process by which it is manufactured that it is necessary to understand both to understand either. Gypsum rock is converted into gypsum plaster by a chemical process which is reversed when the plaster, mixed with sand and water, hardens on the wall.

What Gypsum Is: Gypsum is a non-metallic mineral found in deposits in the earth. It is mined or quarried on a commercial scale in about twenty of the United States and in two Canadian provinces. Celotex Anchor Gypsum plasters are made from rock mined in the states of New York, Michigan, Iowa, Texas, Ohio, and Kansas.

In its pure state, gypsum is hydrous, crystalline calcium sulphate ($CaSO_4.2H_2O$), a dusty, pure white stone that looks and feels something like limestone. Various impurities change its color to gray or brown. About 21% of gypsum is chemically combined water, which, so far as plaster is concerned, is the most important element in its chemical composition. Gypsum owes its commercial value to its peculiar ability to lose part of its chemically combined water on

Gypsum is mined or quarried

application of moderate heat, and to recombine with it at any later time, to harden or set in a dense, rock-like form.

How Gypsum Plaster is Made: Gypsum rock is mined by drilling and blasting, or quarried from close-to-the-surface deposits. It is usually crushed before it is brought to the surface where it is dried and pulverized. It is then calcined or cooked for about ninety minutes, in huge cylindrical kilns or kettles at temperatures of 250° F. to 330° F., where approximately three-fourths of the water in combination with the calcium sulphate is driven off. The result is calcined gypsum ($CaSO_4.\frac{1}{2}H_2O$), called Plaster of Paris or incorrectly "stucco." Calcined gypsum is the basic ingredient of all gypsum plasters; the starting point for all gypsum products.

The Effect of Calcination: When part of the water in gypsum is driven off during calcination, the resultant product is chemically out of balance. It will recombine with water, or "set," the first chance it gets, to strike its natural balance, and revert to its original state. When water is added to calcined gypsum, its characteristic, needle-like crystalline structure is re-formed. The crystals interfinger as they grow larger during the setting process, and lock themselves together to form the hard, rock-like material familiar to everyone as wall plaster. The size and shape of these crystals, the speed with which they form, govern the strength and perfection of a plastered wall.

Gypsum crystals interfinger

Since the amount of water, and the manner in which it is removed is carefully controlled during manufacture, the process by which calcined gypsum is converted into plaster on walls must be equally carefully controlled. The Celotex Corporation makes every effort to supply the trade with the best and most satisfactory plasters for all uses. However, careful manufacture alone cannot insure good results and a satisfactory finished job. The skill of the plasterer and his assistants in mixing and applying mortar is equally responsible. The quality of the sand, the condition of the water, and the manner in which the sand, plaster and water are mixed each has its share in controlling the quality of the finished work.

Every batch is tested

Varieties of Gypsum Plaster

During and after calcination, gypsum is processed to prepare it for the specific use to which it is to be put. The addition of certain ingredients to control the setting time; other ingredients to affect the density or finish; fiber to increase the cohesive strength of the wall, etc., are part of the processing which converts "stucco" or Plaster of Paris into base coat plasters, finish coat plasters, bond plasters, gauging plasters, moulding or casting plasters, or specialty plasters with built-in color or acoustical properties. Each possesses characteristics which make it better suited to its specific use than any other kind of plaster.

Every batch of plaster is carefully tested at the mill before any of it is shipped. If it meets the high specifications established for the brand, it is bagged in tough, multiwalled paper bags and

Mortar: No more than can be used in one hour should be mixed at one time. Plaster which has begun to set cannot be used.

Mortar: Do not retempter after mortar has begun to set. The chemical reaction has already begun, and no amount of water added will make gypsum plaster take a new set.

For base coat plasters, check these things:

Sand: It must be clean and sharp. (See specifications on page 16.)

Water: Add no water before sand and plaster are thoroughly and evenly dry-mixed.

If plasterers follow these simple, fundamental rules, and mix plaster according to manufacturers' directions, most of the causes of trouble which can be traced to mixing will disappear.

Varieties

Base Coat Plasters: Fibered, Unfibered, Extra Fibered. These three plasters are supplied neat—that is, they do not contain sand when manufactured. They account for the greatest tonnage used in this country today. They are made of calcined, tube-milled gypsum to which has been added enough retarder to regulate the set to suit seasonal and market requirements. In the case of the fibered and extra fibered plasters a definite amount of manila fiber which acts as a reinforcing element is also added. The unfibered plaster is occasionally used for sand float finish work and for plastering over brick and tile bases.

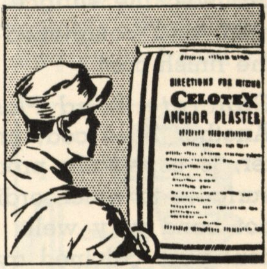
During calcination Celotex Anchor Plasters are treated to produce a smooth-working, plastic product. When mixed with sand and water, they make an easy-spreading, economical mortar.

Base coat plasters go on the wall first. They are applied directly to gypsum lath, fiber lath, wood or metal lath, tile, gypsum block or any other standard plaster base except concrete masonry. Over lath, base coat plasters are usually applied in two layers: first, a scratch coat, which is pressed firmly against the lath to insure a permanent bond, and then a second or brown coat, which brings the base coat up to grounds or specified level. Finish coat or white coat is applied over the brown coat to provide a white, smooth surface for decoration.

The directions for mixing these base coat plasters are simple, and if followed carefully, will result in a satisfactory finished job.

For the first coat on gypsum lath, fiber lath, wood lath or metal lath, use one part plaster and two parts sand by weight. For the first coat on brick, clay tile or gypsum tile, and for the second coat on the laths listed above, use one part plaster to three parts sand by weight.

Mix sand and plaster thoroughly or until the mixture is a uniform color throughout. Hoe the mixture to one end of the mixing box and add clean water at the other end. Hoe plaster into the water and mix to a smooth, even mortar, plastic enough to spread easily; stiff enough to be carried in a hod or on a hawk. A mortar of the right consistency will require about ten gallons of water for each 100-pound bag of plaster.

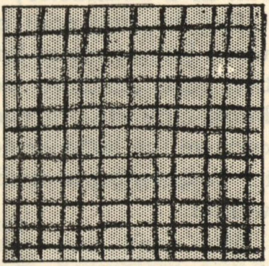


Simple directions on every bag

Do not mix more mortar than can be applied in one hour.

For ordinary two-coat work, when the base coat is to be applied in one operation, sufficient material and pressure should be used to form good, full keys on wood and metal lath, and a good bond with gypsum or fiber board lath, or with masonry base, as the case may be. When the lath is well covered, double back with more mortar, bringing the plaster up to grounds, and straighten to a true, even surface with a rod and darby. Broom or otherwise roughen surface to receive the finish coat.

For three-coat work, when the base coat is to be applied in two stages, the scratch coat should be applied first and pressed firmly into the lath to form good full keys, or to bond firmly, and should cover well. The surface should be well scratched and the plaster allowed to set firm and hard. The second or brown coat should then be applied to bring the plaster up to grounds; the surface leveled and roughened for the finish coat.


Surface should be scratched

Concrete Bond Plaster: Another base coat product, concrete bond plaster, is especially processed for use on concrete surfaces to which ordinary base coat plasters do not bond very well. It is more than ninety per cent pure calcined gypsum to which have been added various ingredients which aid the adhesion of the plaster to concrete surfaces, and a small amount of wood fiber which lightens its weight and reduces the dead-load pull.

Hack concrete surfaces

Directions for mixing and application of bond plaster should be followed with care. The plaster, as it is delivered to the job in bags, is ready for use, and should be mixed with water only; sand should never be added. Concrete surfaces must be cleaned free of all dirt and oil and must be well hacked to provide additional mechanical key, before mortar is applied. Dampen concrete surface if necessary to reduce suction. (See page 62.)

Sanded Plaster: Sanded plaster is processed gypsum scientifically mixed at the plant with the necessary amount of clean, sharp sand to produce the most satisfactory finished wall. It consists of approximately one-third pure calcined gypsum which has been carefully processed during manufacture, two-thirds selected sand, the proper amount of manila fiber, and retarder in sufficient quantity to meet seasonal and market requirements.

In some markets the proper grade of sand* for mixing with plaster is not available. In the winter sources of supply are frequently frozen or inaccessible. There are occasionally times when a scientifically sanded plaster is preferable to box mixed plaster. Sanded plaster is made especially for these uses.

Wood fiber for patchwork

Mixing is simple and almost fool-proof. Directions call for mixing with clean water only.

Wood Fiber Plaster: Wood fiber plaster is made principally for patch work, or for use in localities where a good grade of sand is not available, or when it is preferable not to use sand. It should be used without sand, but if sand is used, no more than one part sand to one part plaster by weight should be used. Sanded wood fiber plaster is used over masonry surfaces (except monolithic concrete).

** See page 16 for specifications for sand.*

Wood fiber plaster is available mill-sanded on special order. The proper quantity of sand best suited to use with this plaster is well mixed with it at the plant. Sanded wood fiber plaster is ready for use with the addition of water, and can be troweled to a smooth, dense surface of great strength and hardness.

Wood fiber plaster is made from carefully processed calcined gypsum to which are added certain selected ingredients which increase its strength and bond. Dry, non-staining wood fibers are also added to lighten the weight of the plaster and to provide additional reinforcement.

Controlling The Setting Time

While the setting time of plaster is timed during manufacture for the requirements of the season and market in which it is sold, there may be occasions when it is desirable to lengthen or shorten the time required for setting. This can be accomplished on the job by adding certain ingredients.

Organic compounds, such as glue, cream of tartar, citric acid, etc., delay or *retard* the formation of gypsum crystals. *Inorganic compounds,* such as lime, portland cement, alum, zinc sulphate, etc., hasten or *accelerate* the formation of gypsum crystals.

Organic matter retards the set

The temperature also has an effect upon the time required for gypsum plaster to set. If part of a batch of mortar is applied to the walls of a warm room, and the balance applied to the walls of a cold room, the mortar in the cold room will set first. The setting time lengthens as the temperature increases.

Retarder: To make gypsum plaster set slower, organic matter may be added to the mortar during mixing. Commercial retarder is made from a ground up combination of hair, hoofs, and other animal matter. Its action is very powerful, and a little added to ordinary fibered plaster will delay the set so that the material can be mixed with sand and applied to walls and worked into place before it sets.

Accelerator: To make gypsum plaster set faster, inorganic matter may be added. A little set gypsum plaster pulverized and added to a batch of mortar during the mixing will act as a strong accelerator. Too often particles of set mortar in the mixing box or adhering to carelessly cleaned tools will be responsible for quick-set plaster when it is not wanted. The addition of too much sand will also accelerate the setting time of base coat plasters.

Inorganic matter accelerates the set

Certain mechanical operations will hasten the setting of gypsum plaster. For instance, violent and long continued mixing of mortar will hasten its set. For this reason, machine-mixed plaster should be retarded at the mill to off-set the accelerating action of the mixer.

Commercial accelerator is made from a mixture of portland cement, alum and zinc sulphate. The advantage of using a commercial accelerator lies in the fact that its chemical combination is definitely known, and by using it, the increase in the speed of the set of the plaster can be controlled by the addition of specified amounts.

Sand

Sand is important. Though it is used principally for bulk to make plaster go farther, and to increase its porosity so that the finish coat will bond more firmly, the success of the finished job depends to a great extent on the amount and kind of sand used. The addition of sand to plaster reduces its strength. The finer the sand, the greater amount of plaster will be required to bind the particles. Therefore, finer sand will result in a weaker finished plaster job than coarser sand. Sharp, well graded plastering sand produces the most satisfactory results. Avoid using excess amounts of sand since the speed of setting rises rapidly and the strength of the finished wall decreases as the amount of sand is increased.

Sand must be clean

It is especially important that sand be clean before it is added to the plaster mix. Bits of organic matter and clay which are a part of almost all "bank sands" will increase the time required for setting and decrease the strength of the finished job. These foreign elements can be washed out and the extra cost of buying well-washed sand will be more than repaid in the superior finished plaster job.

The American Society for Testing Materials has set up standard specifications (A.S.T.M. Designation: C35—36T), against which all sand used for plastering should be checked:

"Sand for use in plaster shall consist of fine granular material composed of hard, strong, durable, uncoated particles which are free from injurious amounts of saline, alkaline, organic, or other deleterious substances.

"The amount of deleterious substances, including material finer than a No. 200 (74-micron) sieve, shall not exceed 5 per cent.

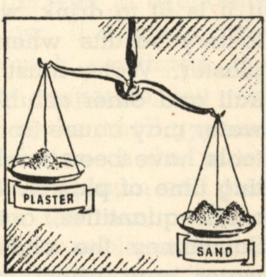
"The sand when subjected to the colorimetric test for organic impurities shall show a color not darker than the standard color, unless it is shown by adequate tests that the impurities causing the color are not harmful in plaster.

"Sand for use in plaster shall be uniformly graded from fine to coarse within the following limits:

	Percentage Retained	
Size of Sieve	*Maximum*	*Minimum*
Retained on a No. 4 Sieve	0	0
Retained on a No. 8 Sieve	10%	0
Retained on a No. 30 Sieve	80%	15%
Retained on a No. 50 Sieve	95%	70%
Retained on a No. 100 Sieve	....	95%

"The sieves shall conform to the requirements of the Tentative Specifications for Sieves for Testing Purposes (A.S.T.M. Designation: E 11) of the American Society for Testing Materials."

Proportions: Plaster mix proportions are given *by weight* and not by volume. This is necessary because different plasters vary considerably in weight per volume because of the differences in grind, density, etc. Plaster which has been "shaken down" during shipment will be denser and a scoop full of it at the end of the trip will weigh more than the same scoop full would weigh at the beginning of the trip.



Proportions are given by weight

The same is true of sand. Very coarse sand will weigh more per volume than fine sand. Damp sand will weigh less than dry sand because of the expanding effect of the water.

Therefore, standard specifications for mixing are usually stated in terms of weight.

How weights vary is shown in the following table:

Dry, fine sand	100 lbs. per cu. ft.
Wet, fine sand	80 lbs. per cu. ft.
Dry, coarse sand	105 lbs. per cu. ft.
Wet, coarse sand	90 lbs. per cu. ft.

Weights of sand will vary according to the size of the particles of sand, and according to the amount of water present. However, on the job it is customary to apportion sand and plaster according to rough volume measurements as follows:

Gypsum Plaster	*Mixed with Damp Sand As Delivered on the Job*	*Proportions of Sand to Plaster By Weight*
100 lb. bag	12½ No. 2 shovels	2 to 1
100 lb. bag	16 No. 2 shovels	2½ to 1
100 lb. bag	19 No. 2 shovels	3 to 1
80 lb. bag	10½ No. 2 shovels	2 to 1
80 lb. bag	12½ No. 2 shovels	2½ to 1
80 lb. bag	15 No. 2 shovels	3 to 1

The shovel referred to is a standard No. 2 square point shovel which will carry an average weight of 16 lbs. of damp or wet sand.

Water

If it is fit to drink, water will usually give satisfactory results when used for mixing gypsum plaster. Water must be clean, and free from alkali and other soluble salts. Exceptionally hard water may cause trouble. Water in which mixing tools have been washed is sure to affect the setting time of plaster. Set gypsum plaster, even in small quantities, acts as a strong accelerator. Sometimes the chemicals used to purify city water may affect the setting time of gypsum plasters. Alum, which is commonly used to purify water, will make plaster set quicker if there are large amounts of it present. Organic matter in well water will, on the other hand, cause plaster to set slower. For the same reason, water from swamps or stagnant pools will cause plaster to set slower. Water containing large amounts of sulphur, which can be readily detected by the smell and taste, will make plaster set slower.

If it's fit to drink, it's fit for plaster

If it is reasonably clean, there is little likelihood that plaster troubles will arise because of the water used in the mix.

It takes about four times as much water to mix up up a batch of plaster as is required for the chemical reaction between the calcined gypsum and the water. For instance, a batch consisting of three hundred pounds of sand and one hundred pounds of fibered plaster will require about eighty pounds of water to make mortar of a workable consistency. Twenty pounds of this water will combine with the gypsum. Sixty pounds will have to escape by evaporation after the plaster has set on the wall.

This free water must be allowed to evaporate normally or trouble will follow. If a newly plastered room is not well enough ventilated, the water in the plaster will not evaporate, but will remain in the plaster. Some of the small gypsum crystals will dissolve in it. Later, as the water does evaporate, this dissolved gypsum will join with the larger crystals, and the result will be a coarse plaster which will crumble and mar easily. This condition is called "sweat-out."

On the other hand, if the conditions within the newly plastered room are such as to dry the plaster too quickly, the water will be evaporated before chemical combination between the calcined gypsum and the water is complete. The result will be a soft, chalky wall which may be easily scratched and pulverized. This condition is called "dry-out."

Mixing Plaster By Hand

"Pulverized set gypsum plaster is sometimes added in small amounts to gypsum plaster when it is desired to hasten the set, and *it is classed as a strong accelerator.*" It is especially important, therefore, that the mixing box be thoroughly cleaned after each batch of plaster has been mixed. Hoe and shovel must be kept clean also, but *don't* wash them in the water to be used in the plaster mix. It does not make much difference whether the small particles of set plaster are mixed in as a result of having been left in the box or come from the water—the result will be the same: the plaster will set faster. Mixing boxes must be kept watertight.

Don't wash tools in mix water

Mix plaster according to the directions printed on the bag. Different kinds of plaster require different handling. If plaster is to be mixed without sand, it should be placed in one end of the mixing box and water poured in at the other end. The plaster should be hoed into the water and thoroughly mixed with it. Enough water to make a mix of the desired consistency should be used. A little plaster may be added if the mix is too soupy, or a little water if it is too stiff. However, no attempt to retemper plaster should be made, and new batches should not be mixed with an old one after it has begun to set.

For plasters requiring sand, dry plaster and dry sand should be thoroughly mixed before water is added. The mixture should then be hoed to one end of the box, and the water poured in at the other, and mixed to the proper consistency.

Mechanical Mixing

Mechanical mixing is considerably different from hand mixing and certain precautions must be taken to avoid later trouble. Violent mixing accelerates the set of plaster. When a mixer is used, special care should be taken to be sure that other causes for acceleration are avoided.

As a precaution, advise manufacturer when a machine mixer is to be used on the job. An increased amount of retarder will be added to the plaster at the plant during manufacture to counteract the accelerating effect of machine mixing.

Machine mixers should be cleaned carefully to remove all particles of set plaster. This can be done by adding small amounts of sand and water after the mix has been dumped, and running the mixer for a few minutes and then dumping. The mixer will then be clean and ready for a new batch.

The proper amount of water for the batch to be mixed should be placed in the mixer first. Then with the mixer revolving, the proper amount of sanded plaster should be added slowly and mixing continued until the mortar is free from lumps. Additional water or additional plaster may be added to make the proper consistency for application. If sand is to be added to the plaster on the job, about one-half the amount of sand required should be added to the water before plaster is introduced into the

Mechanical mixing accelerates the set

mixer. Then all of the plaster should be added, followed by the balance of the sand, and mixing continued until the mortar is free from lumps and is of the proper consistency.

The mix should be dumped as soon as the plaster has reached the proper consistency.

Do not mix more than can be applied in an hour and do not attempt to retemper plaster which has set.

Mixing Problems

Short Working Plaster: When plaster mixed with sand and water will not make a workable mortar, it is called short working. This condition frequently results from over-long or damp storage. Sometimes, due to humid conditions prevailing in summer, plaster will become short working more quickly than it will in winter when the air contains less moisture. If plaster gets wet during shipment or on the job, it will set up quickly and may be short working. Excessive amounts of sand will produce same result.

Short-working plaster does not stick

If mortar does not stick to the plaster base, or if it has the feel and appearance of being oversanded when squeezed in the hand, it is short working. Such plaster will not carry the proper amount of sand without appearing oversanded. Water will rise to the top of the mix and will remain on the surface in the mixing box and the mortar will not spread as far as it should, due to excessive droppings.

The use of less sand in the mix, while more costly, is one way to use up short working plaster. A more economical method is to mix a sack of fresh plaster with each sack of short working material until the short working plaster is used up. It may be necessary to use a greater proportion of fresh material. If the short working plaster is mill sanded, the addition of one sack of fresh, neat plaster to every six or seven sacks of slow working sanded plaster will produce a mix which will be readily workable. Well slaked lime, or hydrated lime that has been soaked overnight will improve the mix if used in the proportion of about a shovel full to each bag of plaster.

Plaster must not be stored too long

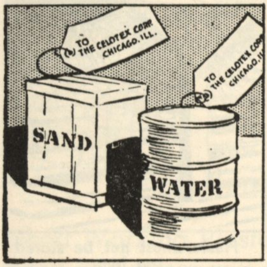
Note: Lime is an accelerator and when used to add plasticity to short working plaster it may be necessary to counteract its effect by adding a small amount of retarder.

Because of the special processes used in the manufacture of Celotex Anchor Plasters, they rarely become short working unless they have been held in storage for many months after manufacture. Celotex Anchor Plasters are smooth, easy working plasters and will carry normal amounts of sand even when stored for as long as a year.

Setting Problems

As explained earlier, gypsum plaster sets by re-combining with the water driven off during calcination. It may take two to three hours (depending upon the amount of retarder in it) for re-crystallization or setting to proceed to completion. The time required for this chemical process has much to do with the success of the finished job.

Season and climate affect the setting time. If the season is wet, plaster may lose strength due to sweat-out if it sets up too fast and does not dry promptly. If the season is dry, plaster may not set properly because it dries too rapidly. In the winter there is danger of freezing and slow drying. In the summer there is danger of too rapid drying.


TO THE CELOTEX CORP. CHICAGO, ILL.
TO THE CELOTEX CORP. CHICAGO, ILL.
SAND
WATER

Sand and water are tested

For this reason, setting time of plaster must be regulated at the mill for the climate and season in which it is to be used. Celotex Anchor Plasters are made to set faster when they are to be used during the summer than when they are made to be used during the winter.

Conditions of the sand and water in various localities affect setting time. Samples of water and sand used in every market are tested at our mills in order that we may be able to supply a plaster of the proper setting time for use in those markets. Whenever source of sand or water is changed, the Celotex Sales Department should be notified so that proper tests can be made and the plaster modified to suit the change.

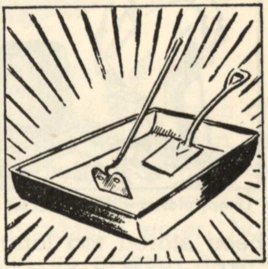
Slow Setting Plaster: Humus from decayed vegetation in sand will retard plaster set. Different sands vary the setting time of plaster. A change from one source of supply of sand to another may affect the setting time in the same shipment of plaster.

Water containing organic matter may result in slow setting plaster. Delayed setting, however, is seldom traceable to this source unless the water used has been taken from a stagnant pool.

Another cause for slow setting plaster may be the use of the wrong plaster for the job in hand.

For instance, plaster made for use during winter, and used in warm weather, is one of the most frequent causes of slow set complaints.

The addition of less than the specified amount of sand may result in a slow set. The use of plaster prepared for machine mix in a mixing box may result in delayed set.


New tools cause slow set

Breaking in new tools and new mortar box are the occasional causes of slow setting plaster. This condition corrects itself as the work proceeds and particles of set plaster accumulate on the tools and in the box.

Two or three pounds of hydrated lime or portland cement added for each sack of plaster and thoroughly mixed with the batch will accelerate the set.

Thoroughly scraping the mixing box so that the adhered particles of set plaster are incorporated with the fresh batch, or the addition of crushed and screened plaster droppings in the proportion of ¼ to ½ pounds per sack of plaster will accelerate the mix. Thorough and vigorous mixing will also accelerate the set. Or commercial accelerators in dry powder form may be added as needed. Follow directions carefully.

Quick Setting Plaster: Silt, clay or salt in sand used for the plaster mix often results in quick setting plaster. Too much sand (more than specified in the directions) will cause plaster to set more quickly than if the correct amounts are used.

Alum and some other chemicals used in water purification will accelerate plaster set. Salt water or water taken from a barrel in which tools have been washed, will result in accelerated set.

The proper plaster must be used in the right place. If wood fibered plaster, for instance, is heavily sanded it will set too quickly. It is intended for use without sand.

Lumpy plaster will be quick set

Damp sand and plaster standing too long dry mixed will result in a quick set when water is added. Plaster which has been allowed to become damp in the sack will become lumpy and will set too quickly. On the other hand, plaster which has been stored too long will tend to set slower.

If scratch or brown coat sets in less than an hour and a half after mixing, the setting time is too short for all ordinary job conditions.

If the plaster is right for the job, quick set can be avoided by the following precautions. Keep tools clean—but *do not* wash them in the water used for the mix. Keep mixing box well scraped to remove all particles of set plaster. Use clean sharp sand. Check the sand you are using to be sure it does not contain too much clay or salt. Check the water to be sure that it has not been treated excessively with purification agents. Use the proper amount of sand, and if it is damp do not allow it to stand dry mixed with the plaster before using.

Glue is a strong retarder

If further retarding seems necessary, dissolve five pounds of pulverized glue in a barrel of water. Add from a pint to a quart to your mix for every sack of plaster. Or two or three pounds of molasses or citric acid dissolved in a barrel of water and used in the mix in the proportion of one pail to two pails of clean water will retard the set.

Commercial retarder is available in dry powdered form and should be used according to directions. Retarder should be thoroughly mixed into the mortar.

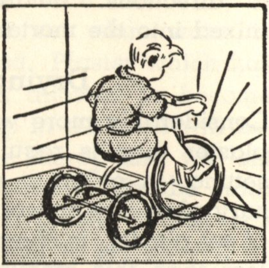
Drying Problems

Considerably more water is added to a batch of plaster than is required for re-crystallization or setting, in order to give the mortar the necessary plasticity or workability. From 15% to 25% of set plaster is chemically combined water. Not less than this amount should be present in the plaster until re-crystallization is complete. Under normal conditions plaster will set before the water in the mortar evaporates, but if it should dry out before crystallization is complete, a soft, chalky wall, known as "dry-out," will result. On the other hand, if the wall remains wet beyond the time when crystallization is completed, some of the crystals will dissolve in the moisture, and when drying eventually does take place, the dissolved gypsum crystals will precipitate on, or merge with, undissolved crystals, forming large coarse granules without the interlocking bond necessary for plaster strength. This condition is called "sweat-out."

Therefore, freshly plastered walls must be protected from warm, dry air currents which may cause too rapid or uneven drying until they have set, and then sufficient ventilation must be provided to prevent them from remaining damp too long. These two conditions may develop generally or only in spots, but they are serious in either case and must be guarded against. Drying can be controlled usually by screening all openings with cheese cloth or similar material.

Soft Walls

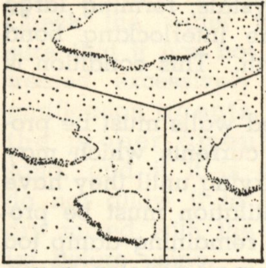
A properly plastered wall should be hard enough to stand normal wear and tear. Occasionally a wall will turn out to be soft and easily marred. There are several causes for this condition.



Walls must stand wear and tear

Dry-Outs: Warm, dry summer weather may cause the water necessary for setting to evaporate from a freshly plastered wall before the chemical reaction is complete. In winter, plastered walls near stoves, radiators, or other artificial heating devices may be dried out before the set is complete. If the plaster is slow setting this condition is more likely to occur and an entire job may turn out to be soft and chalky. Thin plaster or dry wood lath also may cause dry-outs.

Soft, chalky spots or white chalky walls which rub off readily are symptoms of dry-out. Wall surfaces will be lighter in color than they should be and cracks will appear.



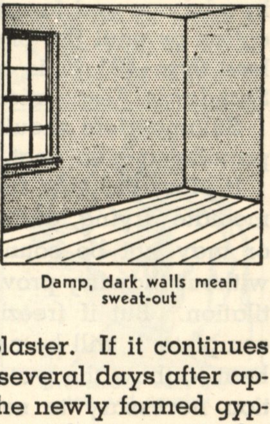
Chalky spots are signs of dry-out

To correct this condition, spray or brush water on the wall with a soft brush until the plaster stops absorbing it. Repeat the process every few hours until the plaster has set and is hard. Small surface cracks can be worked over during the wetting down process.

Never use a solution of zinc sulphate or alum for this wetting down treatment. In spite of the fact that it will produce quick action, the chemically treated water is likely to harden the surface only and leave the keys soft and chalky. Further, the reaction of the zinc sulphate with paint used for subsequent wall decoration will destroy the paint binder and ruin the decoration.

In warm weather be sure that plaster will set on the wall within two or three hours after application. Screen all openings with cheese cloth or similar material so that warm dry winds cannot strike the walls directly. Wet down wood lath at least twelve hours before plastering and again about an hour before plastering. Apply plaster to specified thickness or to grounds. In winter use artificial heat carefully so that no section of the wall will dry out before plaster has set.

Sweat-Outs: Lack of proper drying conditions after plaster has set is responsible for the condition called "sweat-out." From every ton of neat plaster applied to walls, about 1200 to 1300 pounds of water must evaporate. From sanded plaster, about 350 pounds of water per ton of sanded mix must evaporate. Poor air circulation, or cold, damp air will delay evaporation of the 75 to 100 gallons of water in the walls of the average freshly plastered room to such an extent that sweat-out will develop. The use of fine sand in the plaster mix aggravates this condition because it delays drying.



Damp, dark walls mean sweat-out

Sweat-out can be detected by the color of the plaster. If it continues to look dark and damp for several days after application, it is certain that the newly formed gypsum crystals are dissolving in the water in the wall. If provisions for drying the walls are not made promptly, they will become softer and weaker until they are no good at all. There is nothing to be done if walls become too soft except to replaster them.

The only remedy, if the trouble is detected in time, is to provide good air circulation. Open windows and doors, or in cold weather, provide artificial heat. Plaster must be thoroughly dry within two or three days after it has set.

Frozen Plaster: Water will freeze in freshly plastered walls if the temperature falls below the freezing point (32° F.) and stays there long enough. If plaster freezes before it is dry and is allowed to remain frozen for any length time, it will gradually soften and become worthless. If plaster freezes and thaws and freezes a second time, it is sure to be ruined. Water expands when it freezes, and will break up the newly formed gypsum crystals so that the wall will crumble when it eventually dries.

When it is necessary to plaster in freezing weather, artificial heat and adequate ventilation should be provided for sufficient amount of time in advance and for at least ten hours after application or until the plaster has set and dried. No less than 40° F. is allowable by the American Standards Association.

Salamanders should not be used because they provide uneven heat, and smoke up the walls.

If plaster should freeze, the only remedy is immediate drying, and even then, the plaster may or may not be sound. Frozen plaster will dry without thawing provided there is adequate ventilation. But if freezing occurs before setting is complete, it will be necessary to provide artificial heat to thaw the water so that the chemical reaction necessary to setting can take place. The temperature must then be maintained above the freezing point until the plaster is thoroughly dry.

After plaster has dried, low temperatures will not affect it.

Do not apply finish coat over a frozen base coat. It will peel and blister if there is any frost in the wall when it is applied. Color is the clue to frozen plaster. It will look dark and damp, and remain so as long as frost remains in the plaster. Ice crystals may be visible in the surface.

Don't plaster when it is below freezing

Frozen plaster will never be as strong as it would have been if it had not been frozen. If freezing leaves the plaster soft and weak, the only remedy is removal and replastering.

Over-Sanding: Sand is added to base coat plasters to increase their covering capacity and to increase their porosity so that finish coats will bond more firmly. Sand is not cementitious. Plaster is the cementing agent. There must be enough plaster to cement each grain of sand to all adjoining grains of sand if the wall is to be strong and hard. When the ratio of sand to plaster is such that there isn't enough plaster to go around, the result is an over-sanded plaster. The use of too much sand, or sand which is too fine (fine sand has more surface to cover than sand of the proper grade for plastering) will result in a soft wall. The use of plaster which has been stored too long or has been exposed to dampness will produce the effect

Over-sanded walls are soft and crumbly

of over-sanding due to the particles of partially set plaster which are not cementitious.

Soft walls due to over-sanding can be distinguished from soft walls resulting from dry-out and sweat-out by the appearance of the plaster. It will look sandy, it will crumble and rub off; it will scratch and mar easily; cracks may appear for no apparent reason.

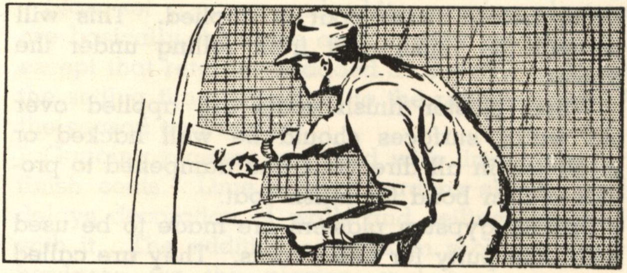
These signs can be checked, if there is any of the mortar used on the job available. What is left after a handful is squeezed as tightly as possible will look decidedly sandy. Another rough test can be made by pulverizing about an ounce of the plaster, and shaking it vigorously with about two ounces of water in a test tube. When the mixture settles, the sand will go to the bottom first, and the plaster will settle on top of it. Judge the proportion *by volume*.

Plaster and sand are mixed on the job on the basis of *weight*. Two parts of sand to one of plaster by weight is equivalent to 1.6 parts of sand to one of plaster *by volume*. Three parts of sand to one of plaster by weight is equivalent to 2.4 parts of sand to one of plaster *by volume*.

Judge the proportion by volume

If the volume of sand is not in proper proportion to the volume of plaster in the test tube, it will be obvious from this test.

However, if the tests are not conclusive, or if careful determination is necessary, complete analysis can be secured by sending an average sample to Celotex laboratories.



FINISH COAT TROUBLE SHOOTING

PLASTERED WALLS are usually finished with a thin coat of plaster which is denser and more resistant to wear than the base coat; which is whiter and smoother for subsequent decoration, or which possesses a decorative character of its own. These finishes can be divided roughly into two classes: gypsum-gauged lime finishes and special finishes.

Gypsum finishing plasters and finishes gauged with gypsum plaster require the same care and attention to details that all other gypsum plasters require. Trouble may develop from mishandling during mixing and application and also as a result of improperly conditioned base coat plaster.

Before any plaster finish is applied, the condition of the base coat should be carefully checked. It should be:

Thoroughly set and hard
Properly sanded
Properly rodded and leveled
Neither too dry nor too wet
Free of troubles such as dry-out, sweat-out, and frost.

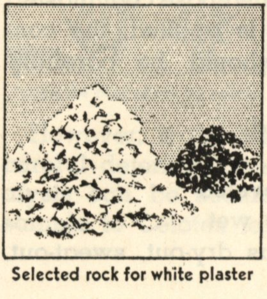
To reduce suction and to improve bond, dry base coat plaster should be dampened with clean water before finish coat is applied. This will prevent the finish coat from rolling under the trowel.

When plaster finish coats are applied over old walls, surfaces should be well hacked or scratched in all directions and dampened to provide a firm bond for finish coat.

Special gypsum plasters are made to be used with lime putty for finish coats. They are called gauging plasters, and their sole function is to provide early strength and hardness for the lime and to facilitate its application. Lime plaster hardens slowly, due to the fact that calcium hydrate, which functions as the cementitious agent, hardens by changing to calcium carbonate on exposure to the air. This process is gradual, and walls cannot be decorated until it is complete.

Gauging Plasters: Quick set common (local or gray) gauging and quick set white gauging plasters are 100% "stucco" or calcined gypsum just as it comes from the kiln. Nothing is added and these two products will set within about 45 minutes after mixing with water, unless retarded on the job. These plasters are not tube milled during calcination as are the base coat plasters. They have less bulk, but mix readily with lime putty, which base coat plasters will not do.

Common gauging plaster is made from gypsum rock which may not be pure white. White gauging plaster is made from selected white rock which insures a white, clean-looking finished wall. White gauging plasters are usually made from western rock which is whiter than that found elsewhere.



Selected rock for white plaster

Slow set common and white gauging plasters are basically the same as the quick set plasters, except that retarder is added at the mill to delay the setting time according to the requirements of the season and market.

Gauging plasters are used with lime putty for finish coats. Lime plaster hardens slowly, and delays decoration of walls and ceilings finished with it. The addition of gypsum provides early hardness for the plaster, and prevents map cracks during the lengthy process of lime carbonation.

Make a ring of lime putty

The mixing of gauging plasters is comparatively simple, but manufacturers' directions must be followed closely. Gauging plasters should always be used with lime putty in the proportion of one measure of DRY gauging plaster to three measures of lime putty *by volume*. Make a ring of lime putty on the mixing board, and put water in the center. Sprinkle the dry gauging plaster in the water, and allow to soak for a few minutes. Cut the plaster into the putty with a trowel, and work thoroughly until the mixture is smooth, of a uniform color, and free from lumps. It is then ready for application.

Dampen the base coat if necessary to reduce suction.

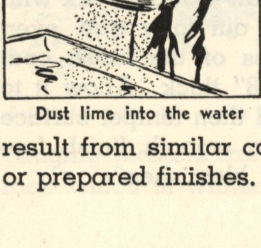
Apply the first coat as thin as possible, pressing it firmly into the base coat. Double back with the second coat, and level out to a true, even surface. The total thickness of the finish coat should be from 1/16" to 1/8" thick. Allow it to draw for a few minutes, and then temper surface with water and trowel to a smooth finish free from "cat faces" and other blemishes.

Finishing Lime: Hydrated lime is made by burning selected limestone in kilns, at a temperature of 2100° F. for about three days, to drive off the combined water. It is then scientifically slacked at the mill, insuring a uniform dependable product. Celotex Anchor Limes are rich in magnesium which produces the smooth easy working putty needed for fine wall finishes. These limes produce finishes, when properly mixed with gauging plaster, which are free from pits and surface imperfections.

Mixing: Place water, enough to thoroughly saturate the lime to be soaked (about 6½ gallons to 50 pounds of hydrated lime), into a clean, watertight box — first. Dust or sift the lime into the water, and allow to soak for at least 24 hours. Water should cover the lime. Mixture will then have a plastic, putty-like consistency, ready for use with gauging plaster as explained above. Screening through a No. 10 sieve will improve the plasticity of the putty and eliminate lumps.

Lime finishes, gauged with gypsum, are subject to troubles as a result of faulty mixing, application, and drying conditions also.

Soft lime finishes may result from using too little gauging plaster, from attempting to apply the finish after the gauging plaster has set, or from improper drying conditions.


Dust lime into the water

Short working mortar may result from using too much gauging plaster. Hard working mortar may be due to too dry a base coat or to over-sanding of base coat.

Loose finish coats will result from similar causes whether they are lime or prepared finishes. All of these troubles can be avoided by careful attention to details and close following of directions. See page 41.

Cracks: Check or map cracks occasionally appear in lime putty finish coats—hydrated lime gauged with gypsum plaster or Keene's Cement. They appear as very fine cracks running in all directions and are not the same as lath cracks which run parallel with or at right angles to the lath. Map cracks may show up in spots or large areas. They may appear all over the surface of the wall.

Check or map cracks may appear

If directions for mixing are followed carefully, map cracks are not likely to develop. They result from using less than the specified amount of gauging plaster with the lime putty, insufficient blending on the board, application after the gauging plaster has set, or not enough troweling. Check cracks will develop in areas deficient in gauging plaster.

Check cracks cannot be repaired. The finish will have to be removed and replaced, or well hacked and scratched, and refinished with a second finish coat.

SPECIAL FINISH TROUBLE SHOOTING

FOR WALLS which depend upon their surface texture for their decorative note, or for walls which must be free from lime in order that they may be decorated as soon as they are dry, there are several special plasters, processed during manufacture for this sort of work.

Prepared Trowel Finish Plaster: Because it contains no lime, prepared trowel finish plaster may be decorated as soon as it is dry. It is made of a base of calcined gypsum to which a definite amount of selected white silica sand and Kaolin clay have been added to give the plaster a dense, hard finish when it has set. It contains enough retarder to delay the set for two hours.

Prepared trowel finish needs only the addition of water to make it ready for use. Place the plaster in one end of the box and the water in the other. Hoe plaster into the water, and allow it to soak for fifteen minutes and then mix. It should be mixed to a smooth consistency, too thin to be carried in a hod; just thick enough to be handled with a trowel. No more than can be applied and troweled smooth in one hour should be mixed at one time.

Any trouble which may develop with this mill-mixed plaster can usually be traced to the improper preparation of the base coat, or to faulty application by an inexperienced plasterer, or to poor drying conditions.

If directions for mixing and application are carried out properly, the results should be satisfactory. The base coat should be thoroughly set, and not quite dry. If it is too wet, the finish coat may blister as it dries. If the base coat is too dry, the finish may roll under the trowel, and be hard to apply. Dampen base coat if it has been allowed to dry completely before the finish is applied. Base coat should be properly roughened by scratching; should not be oversanded; should not contain frost.

Prepared trowel finish should be applied in two operations, first a thin coat well pressed into the base, followed by a second coat doubled back over the first and leveled out. When this has been allowed to draw, trowel to a smooth, even surface using as little water as possible. Work top and bottom wall surfaces at the same time to avoid joinings. When finish has set, proper ventilation must be provided for rapid drying.

Seasonal and climatic conditions may require a correction in the setting time, which is fixed at the mill for normal conditions. If circumstances require a faster or slower set than the prepared trowel finish normally has, it may be retarded or accelerated as necessary by the mechanic.

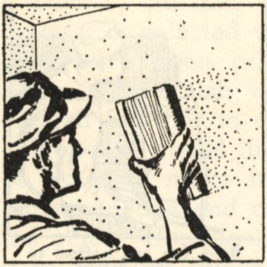
Work top and bottom to avoid joinings

Sand Float Finish Plaster: For rough-finished walls, the surfaces of which are floated with water as a final treatment, sand float finish plaster is used. Its composition is similar to sanded plaster, except that the ingredients are selected for color, and it sets dense and hard. It is made of processed calcined gypsum and enough retarder to delay the set for about two hours, to which has been added about two parts of carefully screened white silica sand to one of gypsum. This mill-mixed product needs only the addition of water to prepare it for use.

Sand float finish plaster should not be applied until the base coat is thoroughly set and almost, but not quite dry. If base has been permitted to dry completely, it must be dampened slightly. It must be lightly broomed for this finish, but not scratched.

Finish should be laid on sparingly with a trowel, to an even surface. It should then be floated to the desired surface finish before the set has taken place, using as little water as possible. The finish should be free from slick spots or other blemishes.

Various surface textures can be achieved by the use of different floats. Wood, carpet, cork, or rubber are the more common materials used for floating operations.

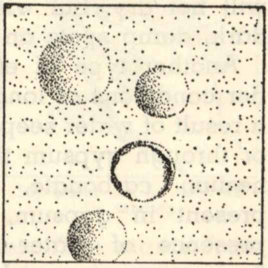

Float to the desired finish

Troubles with sand float finish plaster are not likely to develop if directions are followed carefully. The success of this finish depends largely upon the condition of the base coat. Troubles with the base coat will be reflected in the finish. Over-sanding, dry-out, softness, etc., will make the finish hard to apply, and may affect its bond. If the finish rolls under the trowel as it is being applied, the base coat needs tempering with water. If the finish blisters and peels, the base is too wet.

Drying is important. Finish must be thoroughly set before it dries, and must be dried quickly after set has taken place.

Loose Finish Coat

Several things may cause the finish coat to loosen from the base coat after it sets and dries. The condition of the base coat itself may be responsible. If it is oversanded or too dry, or if it contains frost when the finish coat is applied, the latter will not bond firmly. If the base coat has been left too smooth, the finish coat may loosen after it hardens.



Blisters mean base is too wet

The manner in which the finish coat is applied may be responsible. Directions call for a thin coat of finish plaster, firmly pressed into the base coat, followed by a second layer doubled back over the first. If insufficient pressure is used in laying on the first thin coat, or if the whole thickness of the finish coat is laid on in one operation, the result may be a loosened finish coat when it hardens.

A gypsum-gauged lime putty finish coat may remain soft and loose if insufficient gauging plaster has been used, or if it has not received sufficient troweling.

Loose finish coats cannot be remedied. Removal and re-plastering is the only solution.

Efflorescence

When white, powdery spots or damp spots appear on wall and ceiling surfaces after plaster has set and dried they are very likely to be due to efflorescence. This condition results from the presence of soluble salts in the plaster base, or in the plastered wall itself as a result of using water or sand containing soluble salts, such as sea water, or beach sand.

Efflorescence occurs only under continued conditions of dampness. The salt dissolves, works its way to the surface where it is deposited. When it dries, it is white and powdery. If it is hygroscopic (absorbs moisture from the air) it will not dry, but will retain water, showing as dark, damp spots on the plastered surface.

Another type of efflorescence may occur under conditions of long continued dampness or as a result of water seepage through gypsum plaster or through gypsum tile used for backing. Magnesium carbonate, an impurity occasionally present in gypsum, will react slowly in the presence of water with calcium sulphate to form magnesium sulphate and calcium carbonate. The magnesium sulphate, or Epsom salts ($MgSO_4.7H_2O$), will work to the surface where it will be deposited. Occasionally, but rarely efflorescence will come from the chemical reaction between hydrated dolomitic lime and gauging plaster used for finish coats.

Efflorescence will not develop in dry walls. Water must be present to enable the chemical reaction to take place.

Both types of efflorescence will continue as long as the walls remain damp, or until the salts are used up. The only method of stopping efflorescence is to dry the wall and keep it dry by stopping the passage of moisture at its source with a waterproofing compound.

Efflorescence can usually be removed by washing with clean, luke-warm water, after which walls should be dried rapidly. Do not use zinc sulphate for this purpose. It is worthless for treating efflorescence, and will injure paint applied over it.

Stains and Spots

Sap Stains: Wood lath which has not been properly seasoned may cause yellow stains on plastered surfaces due to the leaching effect of the plaster on the sap and resin in the wood. These stains can be sandpapered off, and will not reappear unless the wall is saturated with water again.

Sap stains can be removed by sanding

Rust: Metal lath, nail heads, rusty tools, or rusty water used in mixing mortar may be responsible for staining plaster. The stains from these causes will develop during mixing and application, usually, although non-galvanized metal lath and nails may cause rust stains to appear on the surface of the plaster if it gets wet and remains so for any length of time. Rust stains are practically impossible to remove.

Mix Spots: Insufficient dry mixing may be responsible for small, soft, white spots in plastered walls. Small lumps of plaster without their share of sand will be slow in setting, will dry before set is complete, and will remain soft. The same trouble will develop if retarder added in the mixing box is not thoroughly mixed with the sand and plaster before the water is added. There will be little spots of slow-set plaster throughout the wall.

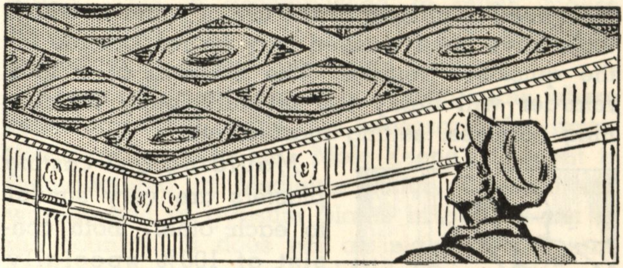
Dust Streaks: Ceilings and occasionally walls plastered over wood lath develop dark streaks parallel with the lath, due to the deposit of dust on the plastered surface. This discoloration appears during the winter when the temperature outside is lower than inside. Since these streaks form their regular pattern over painted as well as unpainted plaster, the theory that they are the result of breathing does not hold up, because paint seals plastered surfaces sufficiently to prevent the passage of air.

Research has shown that the temperature of the surface of plaster over wood lath varies. The plaster over the keys is colder than it is over the wood lath backed strips. Dust carried in the air has a tendency to deposit on cold surfaces. Since the areas over the keys are colder, the dust collects there in long, dark streaks.

Dust streaks over colder areas

This theory is further substantiated by the fact that dust streaks rarely appear on plaster over gypsum lath, fiber lath or metal lath, which insure more uniform temperature over the entire plastered surface.

Dust streaks can be removed by cleaning, repainting, or covered up with wall paper. They cannot be entirely prevented, but may be minimized by insulation over ceilings or behind plastered walls.



MOULDING AND CASTING PLASTERS

GYPSUM PLASTER is made by applying heat to drive off part of the water in combination with the calcium sulphate. When calcined gypsum re-unites with water it gives off heat. In ordinary use, this causes no difficulty, but moulding and casting plasters are used in glue or gelatin moulds, and the heat generated by the plaster is enough to soften the moulds and distort them before the plaster has solidified in the form desired. This trouble is more likely to develop during hot weather when both mould and plaster temperatures are high. The only solution is to use ice water in the mix. This will hold the temperature down long enough for the plaster to set before it melts the glue or gelatin, and it can then be removed before the temperature arises sufficiently to destroy the mould.

Use ice water in the mix

Occasionally, when the plaster has been held in storage too long, or has gotten wet, it will set up too quickly when mixed. Particles of set plaster in the mixing pan or on tools used in mixing, or the use of water in which tools have been washed may be responsible for the quick-set troubles. The addition of a little retarder will delay the set sufficiently for running cornices, setting marble, etc.

Keene's Cement is hard and dense

Moulding and *casting plasters* are very similar to each other. Both consist of 100% specially processed calcined gypsum. A predetermined quantity of various chemical salts are introduced into the calcining kettle, which afford a close control of the characteristics of the finished products. Nothing is added after calcination.

Moulding and casting plasters are made of either common or white rock. Both are dense and strong and have a minimum of voids in the set product. They require a minimum of water for mixing and setting.

Moulding plasters are used for plaster trim, such as running moulds at the ceiling line of walls, dados, details around window and door openings, etc. Casting plasters are used to make ornaments which are cast either in place or in moulds, to be set in place later.

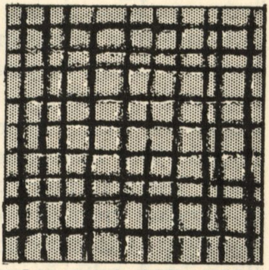
Keene's Cement

Keene's Cement is gypsum but it differs from ordinary gypsum plaster in the way it is manufactured, the way it can be handled on the job, and the way it sets up on the wall. Keene's Cement makes a hard, dense wall which can be polished until it looks like marble. It can be retempered on the job, as no other gypsum plaster can. It is made by driving off all the water in chemical combination, leaving pure calcium sulphate. This is accomplished at much higher temperatures (950° F. to 1400° F.) than employed for calcining ordinary gypsum plasters.

Keene's Cement is used for finish coats where especially hard walls are necessary; for imitation marble work, etc. Most Keene's Cement is manufactured at Medicine Lodge, Kansas, and warehoused at gypsum plants in other parts of the country. It does not air slake as do most gypsum plasters when held too long in storage.

Mixing: Keene's Cement is used with lime putty in the proportion of 1½ measures of Keene's to 1 of lime putty *by volume* for lime putty trowel finish coats. The lime putty is made into a ring on the mixing board, water placed in the middle, and the Keene's Cement sifted into the water. When it has soaked for a few minutes, the lime putty should be cut into the mixture with a trowel until the paste is of a uniform color. Application should be made in the same manner that gypsum-gauged lime putty finishes are applied.

For extra hard wainscoting and similar heavy duty walls, mix three volumes of Keene's Cement to one volume of lime putty. Since for such uses, larger quantities (for thicker coats) are used, mixing is usually done in a mortar box. Keene's Cement should be placed at one end of the box, and water added at the other. Hoe Keene's into the water, and when thoroughly mixed, add properly soaked lime putty, and mix to proper consistency for application.


Base coat should be deeply scratched

Application: Base coat must be thoroughly dry and deeply scratched before lime-Keene's Cement finish is applied. The first layer should be firmly pressed into the base. Double back with a second layer to bring the finish coat up to thickness desired.

Lime does not begin to harden until after it dries, and Keene's Cement, although it serves as a cementing agent from the moment it sets, does not attain its greatest hardness until it has dried thoroughly. Adequate ventilation must be provided, therefore, to insure strong, hard walls.

Lack of strength in lime-Keene's Cement finishes can usually be traced to too much lime in the mix, too dry a base coat, or insufficient troweling of the finish.

Softness may be the result of too rapid drying, which may prevent the Keene's Cement from setting properly.

Pitting and blistering may result from improperly slacked lime, which will not occur if mill hydrated lime is used.

Coverage

Coverage—the area over which a given amount of plaster, or plaster mixed with sand, will spread—depends on several factors. Fresh, properly manufactured, correctly mixed plaster, applied half an inch thick, will spread over just so much area, and no more. However, if the plaster is not carefully made or mixed, or is too old, or has become damp in storage, it may be hard working, fail to adhere, and droppings may be so excessive that coverage will be materially reduced. The base has much to do with coverage also. Keys formed between wood lath take up a varying quantity of plaster, depending upon the way it is applied. But, under normal conditions, and with a good brand of fresh plaster, certain coverage can be expected. These average coverage capacities are shown in the table on the facing page.

Covering Capacities

The following tables of covering capacities are all figured on a basis of 100 square yards. They are not maximum but a margin of safety is taken into consideration.

Fibered, Base Coat Plaster When mixed with different quantities of Sand on Jobs	Gypsum and Fiber Lath 800 to 900 lbs. Sand 2 to 1	Wood Lath 900 to 1100 lbs. Sand 2 to 1	Metal Lath Expan'd & Wire 1700 to 2000 lbs. Sand 2 to 1	Brick or Clay Tile 1000 to 1200 lbs. Sand 3 to 1	Gypsum Tile 750 to 850 lbs. Sand 3 to 1
Wood Fiber Plaster	1650 to 1750 lbs. No Sand Water only	2000 to 2200 lbs. No Sand Water only	3000 to 3500 lbs. No Sand Water only		
Sanded Wall Plaster Ready Mixed	2400 to 2600 lbs. Add No Sand Water only	2800 to 3300 lbs. Add No Sand Water only	4500 to 5000 lbs. Add No Sand Water only	3500 to 4500 lbs. Add No Sand Water only	2800 to 3100 lbs. Add No Sand Water only
Prepared Trowel Finish	500 to 575 lbs.				
Sand Float Finish	725 to 800 lbs.				
Gauging Plaster	Approximately 125 lbs. when proportioned: 2 parts hydrated lime to 1 part of gauging plaster by weight.				
Keene's Cement	As hard finish—400 lbs. Keene's Cement mixed with 100 lbs. lime putty will cover approximately 100 square yards.				
Bond Plaster (Over concrete)	2000 to 2200 lbs.				
Hydrated Finishing Lime	300 to 400 lbs.				

SPECIALTY PLASTERS

THE MIXING and application of specialty plasters, such as acoustical plaster, colored plasters and textured plasters, is a job for an experienced craftsman. Because of their specialized nature, the chances for trouble are greater than with ordinary plasters, and the analysis and explanation of their difficulties is a specialized field. Celotex engineers are available for consultation, and should be consulted whenever there is any question involved.

Directions for mixing and applying specialty plasters are always detailed and specific. They have been compiled from experience, and should be followed with care. There is no short cut to successful plastering. If conditions are unusual, or if the job is complicated in any way, write for instructions, or send for a Celotex specialist. Describe the job, conditions, and problems in detail so that we may analyze it as thoroughly as possible.

Acoustical plasters possess their remarkable ability to deaden sound due to the surface voids and inter-connecting passage-ways which form a network of sound traps all through the half-inch thickness specified for walls and ceilings. These voids and passage-ways are formed in the plastered wall by a bulky filler, which in the case of Celotex Reverbolite Acoustical Plaster is a specially processed form of rock wool developed specifically to provide unusually high sound absorption. Reverbolite Plaster is about 50% rock wool and 50% calcined gypsum.

The application of any acoustical plaster should preferably be made by a trained craftsman, or under the direction of the manufacturer's representative. However, careful attention to details and close adherence to manufacturer's directions should result in a successful installation.

Reverbolite Acoustical Plaster is mixed, ready for use. Do not add sand. Use approximately 10 gallons of water to each 50-lb. sack of Reverbolite Plaster.

Hoe plaster into water and allow to soak for 10 minutes; then mix water thoroughly and whip to a rich working consistency. Add additional water if necessary in order to obtain a fairly thin but easy working mix.

Acoustical plaster deadens sound

Gypsum base coat should be scratched in all directions, and should be fairly green, so that it will not have too great a suction. If base coat has become dry, it will have too great a suction which will hamper the ease of application of the acoustical plaster. Reduce the suction by spraying or dampening the base coat evenly. Care should be taken not to kill suction to such a degree as to prevent Reverbolite Plaster from taking up properly for bond.

Apply first coat of Reverbolite Plaster not less than ¼" thick. Do not trowel this coat excessively; leave fairly rough for second coat. Allow first coat to set thoroughly. Set usually takes place within two or three hours after application, and can be determined by the darker color obtained by plaster, as well as by crusting. Apply second coat to bring to total thickness of ½", as soon as possible after first coat has set. It will go on easier and a smoother finish will be easier to obtain. Trowel second coat to desired finish, taking care to avoid joinings. Textured finishes can be achieved by stippling with a rice brush. When set has taken place, provide adequate ventilation for rapid drying.

Interior Colored Plasters, such as WalTone Plaster, are a combination of Keene's Cement and processed lime plus coloring matter. They are applied over base coat plasters just as other finish plasters are applied. Two types are available: one for troweled or textured finish; the other for float finish. Directions for mixing and application are easy to follow, and attractive finished walls are easy to achieve. No further decoration is necessary.

Soaking overnight improves WalTone

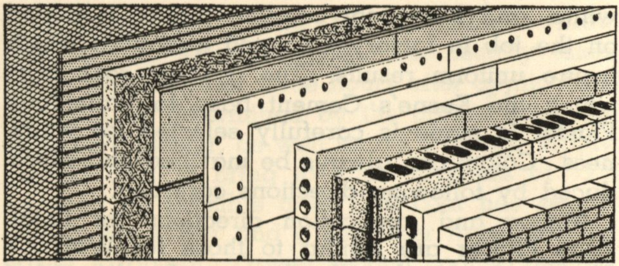
WalTone Plaster is ready for use. It is not necessary to add sand. Mix with clean water only. It may be used immediately after mixing, although two or three hours of standing will result in a marked improvement in application. WalTone Plaster will go on more easily and greater spread will be obtained if mixed to a creamy consistency and allowed to stand overnight before application.

PaletTone Plaster, another Celotex gypsum product, is similar to WalTone Plaster. It is white, and lime-proof coloring matter is added on the job in factory-measured quantities which insure uniform results. The gypsum rock from which the Keene's Cement base for PaletTone Plaster is made is carefully selected for whiteness. Colors can always be matched and reproduced by following directions carefully.

Mixing and application directions for PaletTone Plaster are similar to those for WalTone Plaster, except that the lime-proof colors must be carefully and thoroughly mixed with the dry plaster before water is added.

Because colored plasters, and plasters made for use with coloring matter are especially manufactured for a specific purpose, most of the troubles traceable to job mixing are engineered out at the factory. If trouble should develop, check the base, mixing, and application. Cracks may be due to imperfect base or base coat, or to faulty application technique. Discoloration may be due to too thin an application, or the result of an unevenly dried base coat. Dirty mixing box or tools may result in discoloration. If too much water is used, it is possible that the coloring matter may separate from the plaster or wash during application. Highlights and shadows on textured finishes may make the colored finish look mottled. However, if mixing and application instructions are carefully followed, if drying conditions are correct, desired results can be achieved.

As stated above, Celotex Engineers are always available for counsel on all specialty plaster jobs. If there is any problem in connection with the use or application of any specialty plaster, a letter addressed to The Celotex Corporation at Chicago will receive prompt attention.

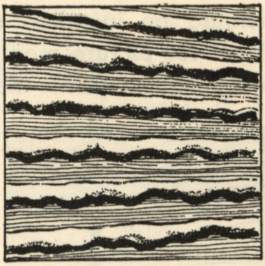


PLASTER BASES

"A BASE THAT BACKS YOU UP" is the headline of an advertisement for Celotex Cane Fibre Lath. And that is what the plastering contractor needs almost as much as he needs good plaster, sand, and workmanship. However, the best plaster and the best base will not prevent cracks from developing in walls and ceilings if the building settles and distorts them. When the plaster base isn't right, the best plastering job in the world won't be right.

There are nearly as many kinds of plaster bases as there are varieties of plaster. Some of them have specific functions besides forming a base for plaster. For instance, Celotex Vaporseal Lath provides a shield against the passage of wind and moisture through the outside walls, and at the same time, insulates the house. Celotex Cane Fibre Lath provides sound and thermal insulation between rooms. Anchor Gypsum Lath provides a fire-resisting barrier which helps to fireproof the building. Perforated gypsum lath provides a strong mechanical key for the plaster when conditions of unusual strain are anticipated. Metal lath, wood lath, brick, clay tile, terra cotta, concrete block have their places among plaster bases, and each possesses peculiarities with which the plasterer must be familiar. These characteristics will be discussed briefly in the following paragraphs.

But the most important factor affecting a plastering job is the bond provided for the plaster by the base. Bond between plaster and base is obtained by the formation of a mechanical key or by suction which holds the plaster to the lath until it sets. Mechanical bond is established when mortar is squeezed between wood lath, through the holes in perforated gypsum lath, through the meshes of expanded metal lath, etc. These protrusions or keys sag of their own weight, and when the plaster sets, they form a firm lock which holds the plaster tight against the lath. Keys take up a lot of plaster, and reduce the covage per ton. The amount varies with the size of the keys.

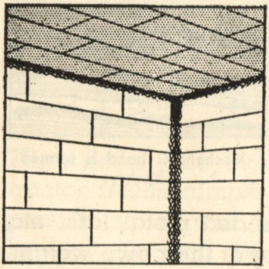


Mechanical bond is formed by keys

Suction bond is established when plaster is pulled into the pores of the surface of the base. When it sets, the base and plaster are like one piece of material. Gypsum lath, fiber board, gypsum tile and masonry provide suction bond for plaster. Finish coat plaster applied to base coat plaster bonds by suction.

Gypsum Lath: Gypsum lath provides a firm, permanent suction bond for gypsum base coat plasters. Cracks will seldom appear in the finished job unless the lath has not been properly installed. Each lath must be nailed securely at both ends and at intermediate supports with 1⅛", 13 gauge, ⅜" head, blued needle-point nails. Avoid continuous joints on opposite faces of the same studs. Joints should be staggered between walls and ceiling so that vertical joints in walls will not meet ceiling joints.

Grounds are important. A full half-inch of plaster should be applied over gypsum lath. Therefore, when ⅜" lath is being used, ⅞" grounds should be installed around openings and as a base for picture mouldings; and ½" intermediate grounds installed also, to be pulled later, and the groove filled in. It is difficult to apply ½" of plaster in one coat. A scratch coat should be applied first, and when it has set, a second or brown coat should be applied to bring the base coat up to grounds.


Gypsum lath is the most trouble-free

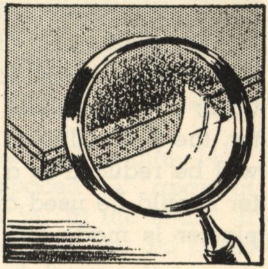
If these precautions are followed, cracks are not likely to appear unless structural defects in the building permit it to sag. Cracks around ceiling joints and wall corners are usually traceable to insufficient grounds, or to over-sanded or dried out plaster.

Gypsum lath should never be sized, painted or dampened before plaster is applied. Lime plaster should never be used on it because it does not bond readily to gypsum. Lath should be reasonably clean and free of dust for the most satisfactory job.

Gypsum lath is such an excellent plaster base because it provides a natural bond for gypsum plaster. It is economical and fireproof; it is uniform; will not swell, warp or buckle.

Fiber Board Lath: The surface of fiber board lath is a veritable forest of tiny, wiry fibers with a multitude of microscopic holes and passage-ways leading down into the board. These provide an excellent grip for gypsum plaster, and if the lath is properly installed, there is little likelihood of plastering troubles which can be traced to the base.

If cracks should appear in the plaster, the trouble probably is due to improper nailing of the lath, or insufficient plaster thickness. Slow setting and slow drying plaster may cause trouble because fiber lath will absorb moisture if it is exposed to it for several days. It may swell and buckle, cracking the plaster applied over it. If necessary, accelerate plaster so that it will set in two or three hours. As soon as the base coat has set, provide adequate ventilation so that walls will dry quickly. It is not necessary to dampen fiber board lath to reduce suction. Do not wet Celotex Cane Fibre Lath before applying plaster.



Fiber board provides excellent bond

Fiber board lath is not a suitable base for lime plaster scratch or brown coats. Lime base coat should never be used. The results will not be satisfactory.

If manufacturer's directions are followed for installing fiber board lath; if the proper grade of gypsum plaster is mixed and applied according to directions, the results are sure to be strong, hard, insulating walls. Grounds should be set for ½" of plaster.

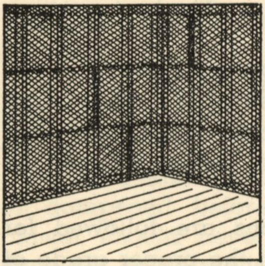
Metal Lath: Plaster adheres to metal lath by means of the keys formed when the mortar is pushed through the meshes or perforations in the metal sheets.

Sagging, cracking and staining are the chief sources of trouble which can be traced to the use of metal lath as a plaster base. All three can be avoided.

If lath of not less than 2.5 pounds per square yard is used for side walls, and not less than 3.0 pounds per square yard is used for ceilings; and if too coarse a mesh is not used, there will be little likelihood of trouble from sagging.

If galvanized or properly painted lath is used, rust stains are not likely to develop.

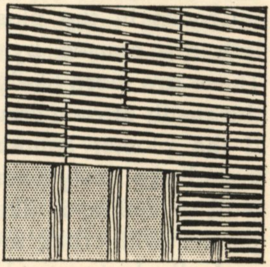
If sheets of lath are lapped at the horizontal joints; if corners where wall meets wall and where walls meet ceiling are thoroughly reinforced according to manufacturer's specifications; and if grounds are set for a full ⅝" of plaster, the possibility of cracks due to the lath base will be reduced to a minimum. The proper plaster should be used over metal lath. Extra-fibered plaster is made for the scratch coat over metal lath. The fiber helps to prevent excessive droppings. Directions for mixing should be followed carefully. No more than the specified amount of the proper grade of sand should be used. Oversanding or soft plaster due to other causes will weaken the bond to the metal lath.



Metal lath should be lapped at joints

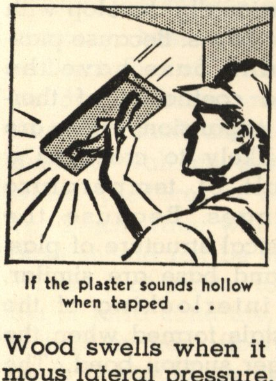
Wood Lath: Mechanical bond is all that holds plaster to wood lath. Gypsum plaster does not form a natural suction bond with wood, and the lath and plaster do not set into a homogeneous wall as in the case of gypsum lath and fiber board lath. It is important that provision be made for adequate mechanical keys, and that they be protected until the wall has set and dried.

The selection, application, and treatment of wood lath before plaster is applied is important. No. 1 grade, non-staining wood, such as white pine or spruce, free from knots and bark, is the best guarantee against the yellow sap stains on plaster. The sap, oil and resin in green, inferior lath will leach out and work to the surface of the plaster during the time the plaster is setting and drying, or later on if the wall is subjected to dampness for any length of time.



Vertical joints should be shifted

Lath should be ⅜" thick by not less than 1$\frac{5}{16}$" nor more than 1⅝" wide, spaced ⅜" apart at the edges, and not less than ¼" at the ends. It should be nailed at each end with two 3-d blued nails and with one nail at each intermediate support for strength and rigidity. Vertical joints should be shifted one stud to the right or left every seventh lath to provide wall reinforcement and avoid plaster cracks due to the settling of the building. Lath should not be run from one room to the next. Break lath at room corners. Grounds should be set for ½" of plaster.



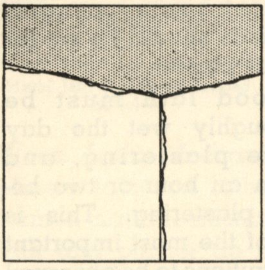
If the plaster sounds hollow when tapped . . .

Wood lath must be thoroughly wet the day before plastering, and again an hour or two before plastering. This is one of the most important precautions to be observed when using wood lath. Wood swells when it gets wet, exerting an enormous lateral pressure. It is sufficient to pinch off the plaster keys and destroy the mechanical bond if it takes place after the plaster is on the wall. Further, if it is not made to swell before the plaster is applied, the water in the mortar will cause the lath to warp and buckle, cracking the plaster beyond repair.

Cracks in the plaster running parallel to the lath are caused by the expansion of dry lath. These are more likely to develop in weak plaster, the result of over-sanding, dry-outs or sweat-outs. If the plaster sounds hollow when tapped, the keys have likely been pinched off, and the whole wall or ceiling is likely to fall if jolted. Too thin plaster will crack more readily over wood lath, and all plaster weaknesses will be more serious when wood lath is used, because of the tremendous force exerted by the expansion of dry wood under the influence of moisture.

The only remedy for the damage caused by the expansion of dry lath is to remove the affected sections and replace them.

Gypsum Partition Tile: Gypsum bonds best to gypsum, and gypsum plaster applied over gypsum block or partition tile forms a solid, substantial wall free from most of the troubles which occasionally develop with other bases. Because plaster and base have the same coefficient of thermal expansion, walls are not likely to crack as a result of temperature changes. Because the physical structure of plaster and base are similar, the interlocking of the crystals formed when the plaster sets makes a stronger suction bond. The surface irregularities moulded into the faces of


Cracks at the angles mean faulty wedging

most gypsum tile provide additional mechanical bond for the plaster.

Plaster applied over gypsum block will carry more sand than that applied over lath bases because less plaster is required for cementing plaster coat to base. Base coat plaster should be mixed three parts of sand to one part of plaster by weight. Grounds should be a full ½".

Base should be dampened before plastering to reduce suction and prevent dry-outs.

If plaster is properly mixed and applied; if base is properly installed, cracks are not likely to develop in walls plastered over a gypsum tile base.

Brick, Clay Tile, Terra Cotta Tile: Plaster will not stick to smooth, glossy surfaces. The plaster will not form a firm suction bond, and it must be reinforced by a mechanical bond provided by hacking masonry surfaces. Plaster will key to these irregularities, and a satisfactory wall can be achieved if directions for mixing and application are followed carefully.

Plaster will not bond to smooth surfaces

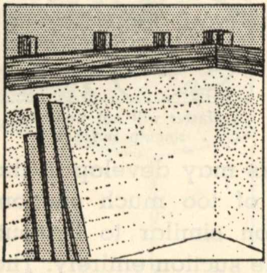
After the surface of the masonry base has been well roughened, it should be dampened to reduce suction. Small check cracks may develop in the finished wall as a result of too much suction, which produces a condition similar to dry-out. Too much water will kill the suction entirely. The base should not be soaked.

Base coat plaster to be applied over brick, clay tile or terra cotta tile, may be sanded wood fiber plaster or neat fibered plaster. If the latter is used, it should be mixed three parts of sand to one of plaster by weight. Lack of the proper amount of sand may result in fine check cracks. Grounds should be set for a full 5/8" thick base coat, and plaster should be applied in two steps: first, a scratch coat well scratched onto the plaster base, followed by a brown coat to bring the base coat up to grounds after scratch coat has set.

If cracks appear at the angle where walls meet ceiling, they are usually due to faulty wedging of the masonry wall at the ceiling. If cracks appear around window and door openings, the cause is likely to be swelling of the wooden bucks or the improper construction of the masonry wall at the openings.

Plaster will not stick to asphalt paints. If the masonry wall is to be waterproofed with such a coating, it must carry sand or some other coarse filler to which plaster will bond. All asphalt coated surfaces must be thoroughly roughened before plastering.

Concrete surfaces: Concrete has a different coefficient of expansion from gypsum plaster. It has a lower absorption than other plaster bases, and it does not provide sufficient suction bond for ordinary sanded plaster. A special plaster has been developed which contains certain ingredients which improve its bond to concrete, and lighten its weight so that there is not quite so much dead-load pull at the point of bond.



Wooden forms leave concrete smooth

However, certain precautions must be taken in preparing concrete surfaces for plastering, or the plaster is likely to loosen and fall from the backing.

Concrete should be set and dry before plaster is applied. Any oil from the forms or efflorescence from the concrete must be removed by washing with a solution of one part muriatic acid and four parts of water. This solution must be thoroughly flushed with clean water.

Wooden or metal forms usually leave concrete surfaces smooth. The surface should be well hacked to provide as much mechanical bond as possible. Suction should be reduced with water, and plaster should be applied in two steps. The first coat should be applied as thinly as possible, pressed in firmly and leveled off. As soon as it has stiffened, the second layer can be doubled back over the first to bring the base coat up to the proper ⅝" thickness. When the finish coat is applied, it should be mixed with as little water as possible to avoid saturating the base coat. Water will weaken the bond between plaster and concrete.

If possible, concrete surfaces should be furred and lathed. While more costly than plastering direct, better and more lasting results will be achieved.

Specialty Bases: Various patented partition materials, which have low sound transmission and high thermal insulation properties, serve also as plaster bases. If manufacturer's instructions for erection are followed carefully, plastering troubles are not likely to develop because surfaces are usually prepared at the factory to receive and hold plaster.

Thermax provides good mechanical bond ›

Thermax Structural Insulation is one of these. Made of shredded wood fibers cemented together with a fire-resisting cement binder, this product provides an excellent bonding surface for plaster. The numerous indentations and crevices in the surface provide ample grip for the mechanical keys formed by the plaster. Regular base coat plasters mixed in the usual way will make satisfactory plastered walls over Thermax Structural Insulation. Grounds should be set for ½". The surface of Thermax Structural Insulation should not be tempered with water before plastering.

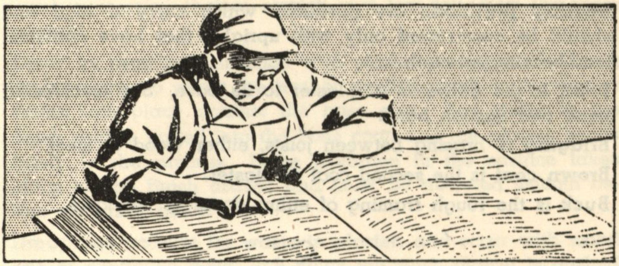
Another structural material with similar sound and thermal insulation properties is made of expanded slag used as an aggregate in concrete, either as monolithic concrete, or as lightweight concrete building units. Regular base coat plasters will bond to this form of concrete masonry because of the porous surface the use of the expanded aggregate gives it. The almost microscopic shell-like cups in the slag, and the rough texture of the slag aggregate surface provide ample mechanical bond for the plaster, and the slag provides some additional suction bond. Suction should be reduced by dampening the surface before plastering. Plaster should be mixed and applied according to manufacturer's directions.

Consultation Service

It is not possible to discuss all of the factors entering into the manufacture, mixing and application of plaster within the limits of this handbook.

When problems arise which do not seem to fall within the limits defined herein, or if more information is required, write to The Celotex Corporation in Chicago, or to the nearest division office.

The Corporation maintains a staff of specialists whose research and experience with gypsum plaster and related products equips them to help you solve your plastering problems. Their services are yours to command when you need them.



GLOSSARY

TO HELP YOU understand the terminology of the plastering craft, the following list of the terms used in the industry is presented with brief definitions. Consult the index at the front of this handbook for other terms not familiar to you. They may be listed there as headings under which full explanation will be found on the pages listed.

A

Accelerator is an inorganic material which speeds up the set of plaster. Most common accelerators are sand, pulverized set gypsum plaster, lime, portland cement, alum, zinc sulphate, long and continued mixing (in a mechanical mixer).

Air slake means to slake or set by absorbing moisture from the atmosphere. Calcined gypsum and burned lime have an affinity for water. Each will unite with it if brought into contact with it. Gypsum plaster stored for long periods in humid air will air slake or partially set as a result of moisture absorption.

B

Back plastering is a method of construction whereby the back of the wall is also plastered. It is used on solid metal lath partitions.

Base ground is galvanized metal formed to act as a ground where cement base and plaster join; also to form a sharp separation.

Beam is a supporting member of a floor or roof, made of various types of material, such as steel, concrete or wood.

Bearing partitions are partitions which carry a load and should be constructed only with uprights that have sufficient load-bearing strength.

Bond is the adhesion of plaster to its base. See mechanical bond and suction bond.

Bridging is bracing between joists, either wood or steel.

Brown coat is the second coat of plaster.

Buck is the rough framing of either doors or windows.

C

Calcination is the process by which gypsum rock is converted to gypsum plaster by roasting or cooking the rock to drive off the water of crystallization. This process, in the manufacture of Celotex Anchor Plaster, is carefully controlled in modern kettles at a temperature of about 330° F.

Cement Plaster is calcined gypsum, processed, ready for use, with or without manila fiber. It contains no sand, wood fibers or other aggregate. (See Neat.)

Centering is the distance from center to center of joists, studs, etc.

Channels are light strips of steel formed with two projecting flanges. Used as studs or furring.

Column is a vertical supporting member of a structure.

Corner bead is a galvanized strip cut and formed to protect projecting corners and act as a ground for plastering.

Cornerite is an 8-inch strip of metal lath bent into the shape of an "L" and applied as corner reinforcement over wood, fiber, or gypsum lath.

Cornice is a projecting ornamental mould usually run with plaster around walls near the ceiling line.

Cross section is an architectural term. A cross section shows the lay-out through finished construction.

D

Dado is a plain, flat surface at the base of a wall. It is often decorated and separated from the upper part of the wall by a moulding. Hard, dense plaster should be used for dados in kitchens, bathrooms, dining rooms, and elsewhere when hard use is anticipated.

Darby is a long, smooth board about 2" wide and from 6' to 8' long, with a projecting handle in the middle. Used to level plaster after it is on the wall or smooth it down to grounds. (See Rod.) To darby means to straighten or true up mortar on a wall before it has set.

Doubling back means to apply scratch and brown coats in quick succession (before scratch coat has set), from the same scaffold.

Draw as used in connection with plastering, especially finish coats, means to allow the freshly applied finish to contract or shrink into place against the base coat. The water in the finish coat is pulled into the base coat, and the plaster bonds firmly in the process. Some distortion in the surface takes place as the finish draws, and must be troweled smooth before set takes place.

Droppings account for waste in plaster, and occur with wood lath or expanded metal lath when too much plaster is pushed through the keys and falls to the floor. Droppings also waste plaster which is hard working, or over-sanded, and does not adhere to the lath so that chunks of it fall to the floor.

E

Expansion bead (casing, etc.) is the same as expanded corner bead. (Same principle employed in door and window trim, and base ground having an expanded metal flange which projects and is bonded into the plaster.)

F

False beam is a non-supporting beam, usually built with channels and lath for ornamental purposes.

Fiber is a reinforcement used in plaster to help prevent droppings, especially on metal lath. When the gypsum wall plaster industry was young, goats' hair was used. As demand increased, and costs rose, cattle hair was substituted, and then sisal fiber replaced both for general use. Sisal is a long, tough vegetable fiber extracted from plants native to Mexico. In the past few years, manila fiber, another vegetable product like hemp, has replaced sisal. Manila fibers are cut, cleaned and graded before use. Plaster is available on order fibered with goat or cattle hair or sisal. Otherwise, fibered and extra fibered base coat plasters are manufactured with manila fiber.

Finish coat is the last or decorative coat of plaster.

Flashing is made of metal strips and is used to protect projecting window and door frames from seepage.

Float is a tool used to float the surface of some plaster finishes, notably sand float finish plaster. The tool is as simple as a section of 2 x 4 covered with carpeting or rubber matting, or it may be a specially made trowel with irregularities on the face which produce some pattern in the freshly plastered wall. The floating process is carried out by passing the float over the surface with a light sweeping motion. Floating a surface must be completed before plaster has set.

Furring is strips of wood or metal attached to a wall or ceiling, and to which in turn, lath is attached. Furring, by building the wall out from the original structure, provides an air space between wall and lath, permits the formation of mechanical keys (if wood, metal or perforated lath is used). Furring and lathing are sometimes absolutely essential, if the wall does not provide a proper base for plaster.

G

Green is the term applied to freshly plastered walls which have set, but are not dry.

Ground is the depth or thickness (from base to surface of base coat) to which a wall or ceiling is to be plastered. Grounds are strips of metal or wood of specified thickness, nailed at right angles to the lath about 24 to 32 inches apart, and used as guides to insure uniform thickness of the base coat. Over metal or wire lath, and over masonry and concrete bases, grounds should be set for ⅝". Over all other types of lath, grounds should be set for ½".

Gypsum is hydrous crystalline calcium sulphate ($CaSO_4 \cdot 2H_2O$) a chalky white rock mined or quarried from the earth. It is the basis of all gypsum plasters.

H

Hangers are pieces of steel, usually ¼" round rods or No. 8 wire, inserted through the form work and wrapped around the reinforcing steel before concrete is poured, to carry the suspended ceiling.

Hawk is the pallet which the plasterer holds in his left hand with a working supply of mortar on it. He uses it like a miniature hod to convey the plaster from the mortar board to the wall. The hawk is a square board approximately 18" on edge with a handle underneath for holding.

Hod is a V-shaped trough, closed at one end, mounted on a long handle. It is used by the helper to carry plaster from mixing box to mortar board.

J

Joinings occur in finish coats when plaster is applied so that one section of the freshly plastered wall sets before the mortar is applied to the adjoining section. The result is a surface imperfection where the two sections meet, usually a jagged line which will collect soot and dust and be very noticeable after several months. To avoid joinings, start work in a corner, work top and bottom of the wall at the same time, and progress in one direction from wall to wall around the room.

Joist is a structural member of a building, supporting the floor.

K

Key is a small protrusion or finger of plaster on the back side of wood lath, expanded metal lath, or perforated gypsum lath, pushed into place as the mortar is applied, and which sags downward behind the lath to set and lock the plaster coat to the lath. Keys provide the mechanical bond for laths to which plaster will not bond by suction.

L

Leaching, the cause of efflorescence, means to wash out, or percolate through. Water percolating through plaster "leaches out" the soluble salts and deposits them on the surface as it evaporates.

Lime is calcined calcium carbonate. Slaked lime is a recombination of calcium oxide with water. Lime putty is a soft smooth mixture of slaked lime and water which has been soaked overnight. Lime putty is used with gauging plasters for finish coats.

M

Mechanical bond is a device by which the plaster adheres more firmly to its base. The keys or fingers of plaster which are pushed through the cracks between wood lath, through the holes of perforated gypsum lath, or into the V joints of regular gypsum lath and cane fiber lath, are mechanical bonds.

Mortar is a mixture of plaster and water or plaster, sand and water to form a plastic mix which can be troweled onto a wall, between bricks, into forms or moulds and which later sets to form a firm hard mass.

Mortar board is a table-high board usually located in the middle of the room to be plastered or adjacent to the wall upon which the plasterer is working. Plaster from the mixing box is carried to the mortar board in a hod.

Mill sanded plaster is plaster mixed with the proper grade of sand in the proper proportions at the mill. It is ready for use with the addition of water.

N

Neat means straight. Neat plaster is made with or without hair, sisal or manila fibers. It is plaster with no sand or other aggregate added at the mill. (See cement plaster.)

Non-bearing partitions are partitions not required to carry any of the floor load.

P

Purlins are horizontal members supporting the rafters in roof construction.

R

Retarder is an organic material which causes slow or delayed crystallization of plaster. Glue, cream of tartar, citric acid, hair, hoofs, other animal or vegetable matter, sands high in organic impurities, low temperature, all are retarders. Retarder as used at the mill to time the set of plaster for general use, is a colloid prepared by treating hair, leather scraps, hoofs, and other organic matter with lime and caustic soda. The retarding action of this colloid is definitely known, and amounts of it are scientifically mixed with plaster at the mill, resulting in a definite span of time between mixing with water on the job and setting on the wall according to the requirements of the season, use to which the plaster is to be put, and market preferences. See Retarder as used on the job. Page 15.

Retemper means to re-mix with water, and in the case of gypsum plaster, after the set has begun to take place. Retempered plaster will not bond to the base, and will not set on the wall.

Rod is a tool consisting of a flat board with a straight edge about six or eight feet long. The side opposite the straight edge is beveled slightly from about four inches in the middle to about two inches at each end. The tool is used to even up the wall after the plaster has been applied and before it sets in order to level the mortar down to grounds. (See Darby.)

Rodded is a term used by plasterers, meaning to straighten up a plastered corner.

Runner channel is the heaviest horizontal member of a suspended ceiling.

S

Sanded plaster is the term applied to plaster to which just the right amount of sand has been added at the mill.

Scratch coat is the first coat of plaster applied to lath to form the key.

Sisal is the name of a long, tough fiber used for fibered base coat plasters. It is a vegetable fiber secured from plants native to Mexico. It is used largely as a substitute for hair fiber. Manila fiber is more generally used for fibered and extra fibered plasters today.

Slack is the same as slake, and is usually used in connection with lime. It is the term applied to the process of hydrating burned lime, or of bringing about the chemical reaction between the lime and its water of hydration.

Set is the term applied to the recrystallization of gypsum plaster when water is added. The crystals interlock to form a solid hard mass similar to the original rock from which gypsum plaster is made.

Spacing is the distance between supports.

Staging is the scaffolding used in construction work.

Stucco (1) Stucco is a term applied to the product which emerges from the kiln after gypsum rock has been calcined. Stucco is what gypsum is called after calcination, before the addition of retarder, fiber or other ingredients. (2) (More common) Portland cement, base and finish coats for exterior finish.

Suction bond is the term applied to the adhesion of plaster to its base by means of an interlocking of the gypsum crystals with the surface of the base. When mortar is applied to some plaster bases, the water it carries is drawn into the surface of the base by capillary attraction. It carries particles of gypsum with it, which crystallize and lock firmly to the surface pores of the base. This kind of bond is firm and permanent.

T

Temper means to wet down a surface to be plastered. Wetting down reduces the suction of base coats for finish coats which may result in the too rapid drying and cracking of the latter.

Trowel is a flat, steel tool used by plasterers to apply plaster to the wall.

Tube mill is a long, rotating cylinder through which base coat plasters pass after calcination. The tube contains tons of steel balls, or long steel rods about an inch in diameter which tumble about and grind the plaster to a fine powder as the tube revolves. The temperature inside the tube mill ranges up to about 240° F. Tube milling increases the bulk, plasticity and sand carrying capacity of plasters, and is a modern improved process by which all the better plasters are finished.

V

Voids are holes or breaks in the continuity of the surface of plaster. They may be caused by insufficient troweling or by bubbles of air in the mortar which may break through the surface of the finish coat as it shrinks in drying. Surface must be thoroughly troweled to free it of voids.

W

Wood fiber as used in plaster is added to increase the structural strength of the plaster and to supplement the crystals in their inter-locking process. Wood fiber, which is selected, non-staining wood, finely shredded, is added to bond plaster and patching plaster, to lighten their weight and provide mechanical reinforcement.

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PRODUCTS

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Celotex ANCHOR Plasters

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Sanded
Bond
Gauging
Moulding and Casting
Prepared Trowel Finish
Sand Float Finish
Reverbolite Acoustical Plaster
WalTone Plaster
Best Bros. Keene's Cement

Plaster Bases

Anchor Gypsum Lath
(Plain, Perforated, Metalized)
Celotex Vapor-seal Cane Fibre Lath
Celotex Cane Fibre Insulating Lath
Metal Lath
Anchor Liner Board
Celotex Gypsum Tile
Thermax Structural Insulation
Metal Accessories

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Mason's Hydrated Lime and Hydrated Finishing Lime
Metal Lath and Metal Accessories

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In certain territories, gypsum lath, sheathing, and wall board are sold by The Celotex Corporation as selling agent, and not as principal.

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